



DEFENSE INFORMATION SYSTEMS AGENCY

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IN REPLY
REFER TO: Joint Interoperability Test Command (JTE)

Ser JT4/1224
18 February 2010

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Special Interoperability Test Certification of the Fujitsu FLASHWAVE 7500 with Software Release 6.1.2

References: (a) Department of Defense Directive 4630.5, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) Chairman, Joint Chiefs of Staff Instruction 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c) and (d), see enclosure 1

1. References (a) and (b) establish the Joint Interoperability Test Command (JITC) as the responsible organization for interoperability test certification.

2. The following Fujitsu hardware and software items will hereinafter be referred to as the System Under Test (SUT).

- a. FLASHWAVE 7500 Two-Degree Reconfigurable Optical Add-Drop Multiplexer (ROADM) 40-Channel Software Release 6.1.2
- b. FLASHWAVE 7500 Two-Degree Wavelength Selective Switch ROADM 40-Channel Software Release 6.1.2
- c. FLASHWAVE 7500 Fixed Optical Add-Drop Multiplexer and or ROADM 40-Channel Software Release 6.1.2
- d. Multi-degree Hub node scalable in-service to a 12-degree hub configuration 40-Channel Software Release 6.1.2

The SUT met all tested critical interoperability requirements as set forth by the Unified Capabilities Requirements (UCR) 2008 (reference [c]) and is certified as interoperable for use with the Defense Information Systems Network (DISN) in accordance with UCR, section 5.5.2 Optical Transport Systems (OTS). The JITC does not certify, and the DISN Program Management Office has not authorized, any other configurations, features, or functions, except those cited in this memorandum. This certification expires upon changes that affect interoperability, but no later than Three years from the date of this memorandum.

3. The JITC bases these findings on UCR testing, DISN Interoperability (IOP) testing, and reviews of the vendor's Letters of Compliance (LOC). The JITC conducted UCR testing and

DISN IOP testing at the Advanced Technology Test Facility, Indian Head, Maryland during August and September 2009. The JITC Information Assurance (IA) test team completed IA testing and published their findings in a separate report (reference [d]). The Certification Testing Summary (Enclosure 2) describes the test configurations and documents the UCR and DISN IOP test results.

4. Table 1 shows the SUT Overall Test Summary and Table 2 lists the Overall Capability and Feature Requirements used to evaluate the SUT IOP.

Table 1. SUT Overall Test Summary

UCR Test Interfaces			
UCR Section 5.5.2 Required Interfaces	Required	Status	Remarks
OC-48	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OC-192	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OC-768	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
1 Gigabit Ethernet	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
10 Gigabit Ethernet-WAN	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
10 Gigabit Ethernet-LAN	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
STM-16	Yes	Not-Certified	Currently, this feature is not supported by the system and has not been tested.
STM-64	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
STM-256	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OTU1/ODU1	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
OTU2/ODU2	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
OTU3/ODU3	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
DISN Interoperability Test Interfaces			
DISN Required Interfaces	Required	Status	Remarks
OC-48	Yes	Certified	Met all CRs and FRs.
OC-192	Yes	Certified	Met all CRs and FRs.
1 Gigabit Ethernet	Yes	Certified	Met all CRs and FRs.
10 Gigabit Ethernet-WAN	Yes	Certified	Met all CRs and FRs.
10 Gigabit Ethernet-LAN	Yes	Certified	Met all CRs and FRs
Features and Capabilities			
Features and Capabilities	Required	Status	Remarks
System Administration	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
System Performance	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
System Protection	Yes	Certified with Exceptions See Note 1	All SUT Modules (except QMC1, QRC1 and RGC1) met all CRs and FRs. via combination of testing and Fujitsu LOCs - See Note 1
Security (IA)	Yes	See Note 2	See Note 2.
NOTES: 1 Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60-millisecond switch time threshold requirement. 2 Security is tested by the Joint Interoperability Test Command Information Assurance test teams and is published in a separate report.			
LEGEND: CR Capability Requirements DISN Defense Information Systems Network FR Feature Requirements LAN Local Area Network LOC Letter of Compliance OC Optical Carrier ODU Optical Channel Data Unit OTU Optical Channel Transport Unit STM Synchronous Transport Module SUT System Under Test UCR Unified Capabilities Requirements WAN Wide Area Network			

Table 2. SUT Overall Capability and Feature Requirements

UCR Test Interfaces			
Interface	Required	Requirements Required (R) or Conditional (C)	References
OC-48	Yes	OC-48 and 2.5G interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.1
OC-192	Yes	OC-192 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
OC-768	Yes	OC-768 and 40 Gigabit interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6
Gigabit Ethernet	Yes	1 Gigabit Ethernet interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.3 UCR 2008, Section 5.3.3.4.1, 5.3.3.5.1, 5.3.3.6.1
10 Gigabit Ethernet-WAN	Yes	10 Gigabit Ethernet-WAN interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.4
10 Gigabit Ethernet-LAN	Yes	10 Gigabit Ethernet-LAN interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.5
STM-16	Yes	STM-16 interface requirements (R) (See Note-2)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.1 (See Note-2)
STM-64	Yes	STM-64 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
STM-256	Yes	STM-256 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6
OTU1/ODU1	Yes	OTU1/ODU1 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
OTU2/ODU2	Yes	OTU2/ODU2 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
OTU3/ODU3	Yes	OTU3/ODU3 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
DISN Interoperability Test Interfaces			
Interface	Required	Requirements Required (R) or Conditional (C)	References
OC-48	Yes	DISN OTS interoperability requirements for OC-48 interface (R)	DISN-OTS-IOP-01, 19, 20, 24, 25.
OC-192	Yes	DISN OTS interoperability requirements for OC-192 interface (R)	DISN-OTS-IOP-01, 02, 03, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 21, 22, 23, 26, 27.
Gigabit Ethernet	Yes	DISN OTS interoperability requirements for Gigabit Ethernet interface (R)	DISN-OTS-IOP-01, 04, 17.
10 Gigabit Ethernet-WAN	Yes	DISN OTS interoperability requirements for 10 Gigabit Ethernet-WAN interface (R)	DISN-OTS-IOP-01, 16.
10 Gigabit Ethernet-LAN	Yes	DISN OTS interoperability requirements for 10 Gigabit Ethernet-LAN interface (R)	DISN-OTS-IOP-01, 15, 18.
SUT Features and Capabilities			
Feature/Capability	Required	Requirements Required (R) or Conditional (C)	References
System Administration	Yes	System Provisioning Options (EMS/NMS Operations Stand Alone and Via OSC) (R)	UCR 2008, Section 5.5.2.1.1.6, 5.5.2.1.2.1.1, 5.5.2.1.2.1.2, 5.5.2.1.2.1.3, 5.5.2.6.1, 5.5.2.6.2, 5.5.2.6.3, 5.5.2.6.4, 5.5.2.6.5, 5.5.2.6.6, 5.5.2.6.7, 5.5.2.10. DISN-OTS-IOP-01.
		Fault Management Options (Internal BERT, Equipment Redundancy, Automatic Laser Shutdown, and Housekeeping Alarms Capability) (R)	UCR 2008, Section 5.5.2.5.3, 5.5.2.8.12, 5.5.2.8.38, 5.5.2.9.20.
		Software Upgrade/Downgrade and Configuration Backup/Restoral Options (R)	UCR 2008, Section 5.5.2.8.40, 5.5.2.8.43, 5.5.2.8.44, 5.5.2.8.45, 5.5.2.8.39.
		Wavelength Management Options (Tuning, Addition and Deletion of Wavelength) (R)	UCR 2008, Section 5.5.2.5.1, 5.5.2.5.2, 5.5.2.1.13, 5.5.2.11.12, 5.5.2.11.13, 5.5.2.11.19.
System Performance	Yes	System Protection Options (Manual and Automatic Path Protection and Restoral) (R) (See Note-1). Voice over Internet Protocol SIP and H.323 performance via Gigabit Ethernet. (R)	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29, DISN-OTS-IOP-17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. (See Note-1) UCR 2008, Section 5.3.3.4.1, 5.3.3.5.1, 5.3.3.6.1
System Protection	Yes	System Protection Options (Manual and Automatic Path Protection and Restoral) (R) (See Note-1)	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29, DISN-OTS-IOP-17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. (See Note-1)

Table 2. SUT Overall Capability and Feature Requirements (continued)

SUT Features and Capabilities					
Feature/Capability	Required	Requirements Required (R) or Conditional (C)		References	
Security (Information Assurance)	Yes	Defense Information Assurance Certification and Accreditation Process and Security Technical Implementation Guides (R)		UCR 2008 Section A9.6	
NOTES:					
1 Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60-millisecond switch time threshold requirement.					
2 Currently, this feature is not supported by the system and has not been tested.					
LEGEND:					
BERT	Bit Error Ratio Test	NMS	Network Management System	R	Required
C	Conditional	OC	Optical Carrier	SIP	Session Initiation Protocol
DISN	Defense Information Systems Network	ODU	Optical Channel Data Unit	STM	Synchronous Transport Module
EMS	Element Management System	OSC	Optical Supervisory Channel	SUT	System Under Test
IOP	Interoperability	OTS	Optical Transport System	UCR	Unified Capabilities Requirements
LAN	Local Area Network	OTU	Optical Channel Transport Unit	WAN	Wide Area Network

5. In accordance with the Program Manager's request, the JITC did not prepare a detailed test report. The JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program, which .mil/gov users can access on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at <http://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (Secure Internet Protocol Router Network).

6. The JITC point of contact is Mr. Derwin Collins, DSN 354-2620, commercial (301) 744-2620, FAX DSN 354-2688, or e-mail address is derwin.collins@disa.mil. The tracking number for the SUT is TN 0915503. The JITC mailing address is 3341 Strauss Avenue, Suite 236, Indian Head, Maryland 20640-5149.

FOR THE COMMANDER:



2 Enclosures a/s

for RICHARD A. MEADOR
Chief, Battlespace Communications
Portfolio

JITC Memo, JTE, Special Interoperability Test Certification of the Fujitsu FLASHWAVE 7500
with Software Release 6.1.2

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ADDITIONAL REFERENCES

- (c) Office of Assistant Secretary of Defense for Networks and Information Integration/
Department of Defense (DoD) Chief Information Officer Document, "Department of
Defense Unified Capabilities Requirements 2008," 22 January 2009
- (d) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Fujitsu
FLASHWAVE 7500 with Software Release 6.1.2 (TN 0915503)," 1 October 2009

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CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. The Fujitsu FLASHWAVE 7500 Reconfigurable Optical Add-Drop Multiplexer (ROADM) platform components described in paragraph 5.a through 5.d are hereinafter referred to as the System Under Test (SUT)

2. PROPONENTS. United States (US) Army, Headquarters (HQ) United States Army Information Systems Engineering Command

3. PROGRAM MANAGER. Mr. Gary Kitsmiller, AMSEL-IE-IS, Bldg 53301, Fort Huachuca, Arizona, 85613-5300, email: gary.kitsmiller@us.army.mil

4. TESTER. Joint Interoperability Test Command (JITC), Indian Head Maryland.

5. SYSTEM UNDER TEST DESCRIPTION. The SUT is based on advanced Wavelength Selective Switch technology that enables optical mesh and hub network architectures, which are key components for building an all optical high-capacity backbone network in the Department of Defense (DoD). It is a transport network element that offers capacity of 1.6 Tera bits per second, provides up to 40 wavelengths services, features transmission paths exceeding 1000 km, and supports up to 24 intermediate add/drop nodes. Fujitsu designed the system to add value to the DoD networks by enabling the DoD to aggregate and transport traffic efficiently.

The following is a brief description of SUT's hardware and software platforms:

- a. FLASHWAVE 7500 Two-Degree ROADM 40-Channel Software Release 6.1.2
- b. FLASHWAVE 7500 Two-Degree Wavelength Selective Switch ROADM 40-Channel Software Release 6.1.2
- c. FLASHWAVE 7500 Fixed Optical Add-Drop Multiplexer and ROADM 40-Channel Software Release 6.1.2
- d. Multi-degree Hub node scalable in-service to a 12-degree hub configuration 40-Channel Software Release 6.1.2
- e. NetSmart 500 EMS Software Release 3.12.0 is a Windows-based craft interface tool. The NetSmart 500 software supports graphical shelf views, equipment and facility provisioning, alarm surveillance, software download, remote memory backup, and remote memory restore capabilities, and cross-connect provisioning. Only used for configuration purposes and is not certified as a part of the SUT.
- f. NetSmart 1500 NMS Software Release 6.0 provides a full suite of network and element management features, enabling turn up of Ethernet, Wavelength Division Multiplexing, Synchronous Digital Hierarchy (SDH), and Synchronous Optical Network (SONET) services. Only used for configuration purposes and is not certified under the SUT

Although the SUT supports the SDH standard, the SUT does not support Synchronous Transport Module (STM)-16 interfaces; therefore, the JITC did not test this interface and the DISN Program Management Office has not authorized it for use with the DISN.

6. OPERATIONAL ARCHITECTURE. The SUT falls under the Optical Transport Systems Unified Capabilities Requirements (UCR). Figure 2-1 illustrates the JITC Indian Head Advanced Technologies Test bed configuration, which simulates the Defense Information Systems Network (DISN) operational architecture.

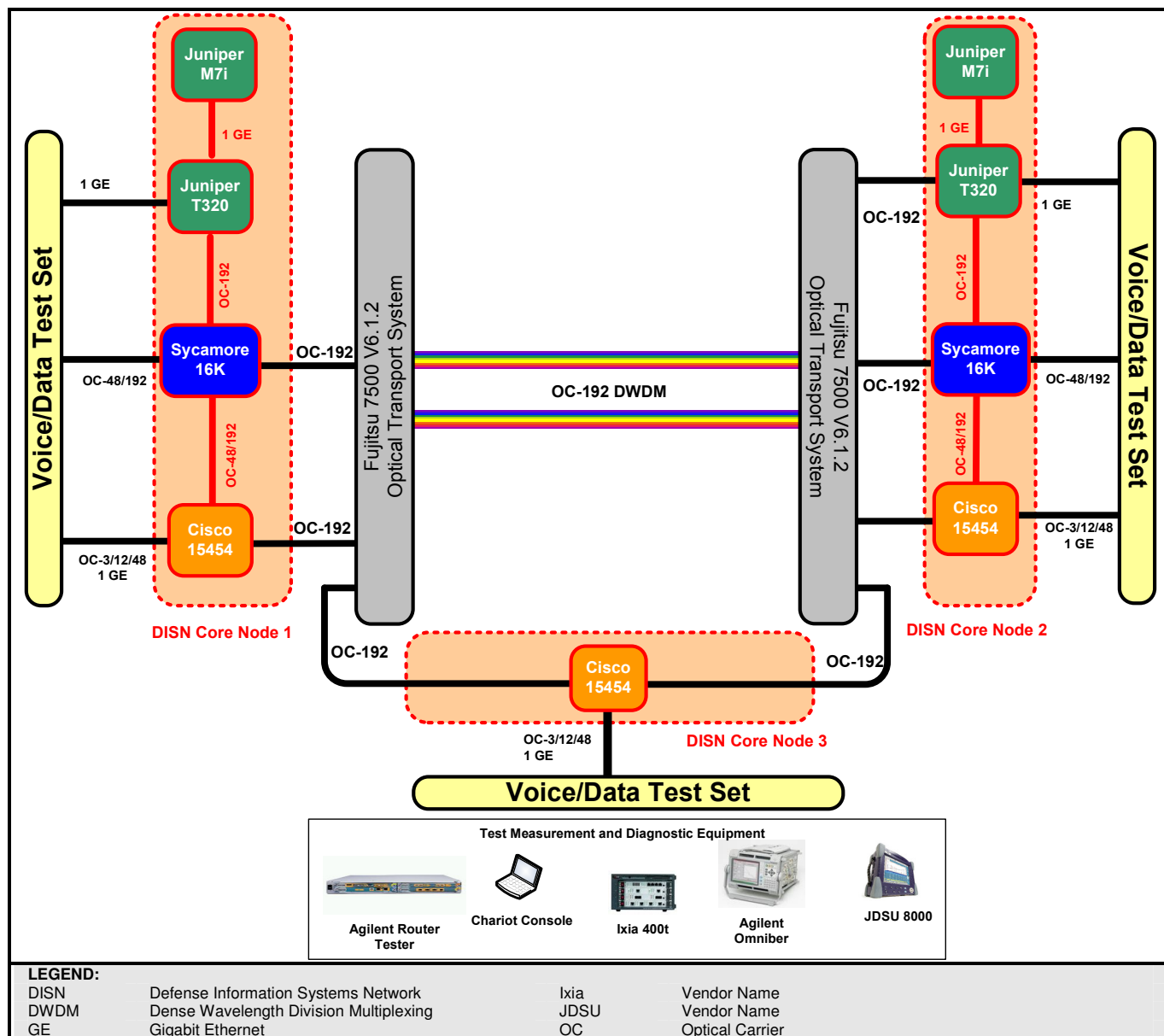


Figure 2-1. Indian Head Advanced Technologies Test Bed

7. REQUIRED SYSTEM INTERFACES. Requirements for UCR Compliance testing were selected from UCR 2008 and requirements for DISN Interoperability (IOP) testing were derived from actual DISN deployment at different theaters, JITC also reviewed the vendor's Letters of Compliance (LOC) for certain UCR requirement that were not testable at the time of testing. Table 2-1 shows the SUT Overall Test Summary and Table 2-2 lists the Overall Capability and Feature Requirements used to evaluate the SUT interoperability.

Table 2-1. SUT Overall Test Summary

UCR Compliance Test Interfaces			
UCR Section 5.5.2 Required Interfaces	Required	Status	Remarks
OC-48	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OC-192	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OC-768	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
1 Gigabit Ethernet	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
10 Gigabit Ethernet-WAN	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
10 Gigabit Ethernet-LAN	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
STM-16	Yes	Not-Certified	Currently, the system does not support this feature.
STM-64	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
STM-256	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
OTU1/ODU1	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
OTU2/ODU2	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
OTU3/ODU3	Yes	Certified	Met CRs and FRs via Fujitsu LOCs
DISN Interoperability Test Interfaces			
DISN Required Interfaces	Required	Status	Remarks
OC-48	Yes	Certified	Met all CRs and FRs.
OC-192	Yes	Certified	Met all CRs and FRs.
1 Gigabit Ethernet	Yes	Certified	Met all CRs and FRs.
10 Gigabit Ethernet-WAN	Yes	Certified	Met all CRs and FRs.
10 Gigabit Ethernet-LAN	Yes	Certified	Met all CRs and FRs.
Features and Capabilities			
Features and Capabilities	Required	Status	Remarks
System Administration	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
System Performance	Yes	Certified	Met CRs and FRs via combination of testing and Fujitsu LOCs
System Protection	Yes	Certified with Exceptions See Note 1	All SUT Modules (except QMC1, QRC1 and RGC1) met all CRs and FRs. via combination of testing and Fujitsu LOCs - See Note 1
Security (IA)	Yes	See Note 2.	See Note 2.
NOTES:			
1 Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60- millisecond switch time threshold requirement.			
2 Security is tested by JITC Information Assurance test teams and published in a separate report.			
LEGEND:			
CR Capability Requirements		ODU Optical Channel Data Unit	
DISN Defense Information Systems Network		OTU Optical Channel Transport Unit	
FR Feature Requirements		STM Synchronous Transport Module	
JITC Joint Interoperability Test Command		SUT System Under Test	
LAN Local Area Network		UCR Unified Capabilities Requirements	
OC Optical Carrier		WAN Wide Area Network	

Table 2-2. SUT Overall Capability and Feature Requirements

UCR Test Interfaces			
Interface	Required	Requirements Required (R) or Conditional (C)	References
OC-48	Yes	OC-48 and 2.5 Gigabit interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.1
OC-192	Yes	OC-192 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
OC-768	Yes	OC-768 and 40 Gigabit interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6

Table 2-2. SUT Overall Capability and Feature Requirements (continued)

UCR Test Interfaces			
Interface	Required	Requirements Required (R) or Conditional (C)	References
Gigabit Ethernet	Yes	1 Gigabit Ethernet interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.3 UCR 2008, Section 5.3.3.4.1, 5.3.3.5.1, 5.3.3.6.1
10 Gigabit Ethernet-WAN	Yes	10 Gigabit Ethernet-WAN interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.4
10 Gigabit Ethernet-LAN	Yes	10 Gigabit Ethernet-LAN interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.5
STM-16	Yes	STM-16 interface requirements (R) (See Note-2)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.1 (See Note-2)
STM-64	Yes	STM-64 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
STM-256	Yes	STM-256 interface requirements (R)	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6
OTU1/ODU1	Yes	OTU1/ODU1 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
OTU2/ODU2	Yes	OTU2/ODU2 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
OTU3/ODU3	Yes	OTU3/ODU3 interface requirements (R)	UCR 2008, Section 5.5.2.1.2.1.3, 5.5.2.6.7
DISN Interoperability Test Interfaces			
Interface	Required	Requirements Required or Conditional	References
OC-48	Yes	DISN OTS interoperability requirements for OC-48 interface (R)	DISN-OTS-IOP-01, 19, 20, 24, 25.
OC-192	Yes	DISN OTS interoperability requirements for OC-192 interface (R)	DISN-OTS-IOP-01, 02, 03, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 21, 22, 23, 26, 27.
Gigabit Ethernet	Yes	DISN OTS interoperability requirements for Gigabit Ethernet interface (R)	DISN-OTS-IOP-01, 04, 17
10 Gigabit Ethernet-WAN	Yes	DISN OTS interoperability requirements for 10 Gigabit Ethernet-WAN interface (R)	DISN-OTS-IOP-01, 16.
10 Gigabit Ethernet-LAN	Yes	DISN OTS interoperability requirements for 10 Gigabit Ethernet-LAN interface (R)	DISN-OTS-IOP-01, 15, 18.
SUT Features and Capabilities			
Feature/Capability	Required	Requirements Required (R) or Conditional (C)	References
System Administration	Yes	System Provisioning Options (EMS/NMS Operations Stand Alone and Via OSC) (R)	UCR 2008, Section 5.5.2.1.1.6, 5.5.2.1.2.1.1, 5.5.2.1.2.1.2, 5.5.2.1.2.1.3, 5.5.2.6.1, 5.5.2.6.2, 5.5.2.6.3, 5.5.2.6.4, 5.5.2.6.5, 5.5.2.6.6, 5.5.2.6.7, 5.5.2.10. DISN-OTS-IOP-01.
System Administration	Yes	Fault Management Options (Internal BERT, Equipment Redundancy, Automatic Laser Shutdown, and Housekeeping Alarms Capability) (R)	UCR 2008, Section 5.5.2.5.3, 5.5.2.8.12, 5.5.2.8.38, 5.5.2.9.20.
		Software Upgrade/Downgrade and Configuration Backup/Restoral Options (R)	UCR 2008, Section 5.5.2.8.40, 5.5.2.8.43, 5.5.2.8.44, 5.5.2.8.45, 5.5.2.8.39.
		Wavelength Management Options (Tuning, Addition and Deletion of Wavelength) (R)	UCR 2008, Section 5.5.2.5.1, 5.5.2.5.2, 5.5.2.1.13, 5.5.2.11.12, 5.5.2.11.13, 5.5.2.11.19.

Table 2-2. SUT Overall Capability and Feature Requirements (continued)

SUT Features and Capabilities			
Feature/Capability	Required	Requirements Required (R) or Conditional (C)	References
System Performance	Yes	System Protection Options (Manual and Automatic Path Protection and Restoral) (R)(See Note-1) Voice over Internet Protocol Session Initiation Protocol and H.323 performance via Gigabit Ethernet. (R)	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29, DISN-OTS-IOP-17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. (See Note-1) UCR 2008, Section 5.3.3.4.1, 5.3.3.5.1, 5.3.3.6.1
System Protection	Yes	System Protection Options (Manual and Automatic Path Protection and Restoral) (R) (See Note-1)	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29, DISN-OTS-IOP-17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. (See Note-1)
Security (Information Assurance)	Yes	Defense Information Assurance Certification and Accreditation Process and Security Technical Implementation Guides (R)	UCR 2008 Section A9.6
NOTES: 1 Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60-millisecond switch time threshold requirement. 2 Currently, this feature is not supported by the system and has not been tested.			
LEGEND: BERT Bit Error Ratio Test NMS Network Management System R Required C Conditional OC Optical Carrier STM Synchronous Transport Module DISN Defense Information Systems Network ODU Optical Channel Data Unit SUT System Under Test EMS Element Management System OSC Optical Supervisory Channel UCR Unified Capabilities Requirements IOP Interoperability OTS Optical Transport System WAN Wide Area Network LAN Local Area Network OTU Optical Channel Transport Unit			

8. TEST NETWORK DESCRIPTION. The JITC tested the SUT at the Indian Head Advanced Technology Testing (ATT) Laboratory in a manner and configuration similar to the DISN operational environment. Figures 2-2 through 2-4 illustrates the test configurations.

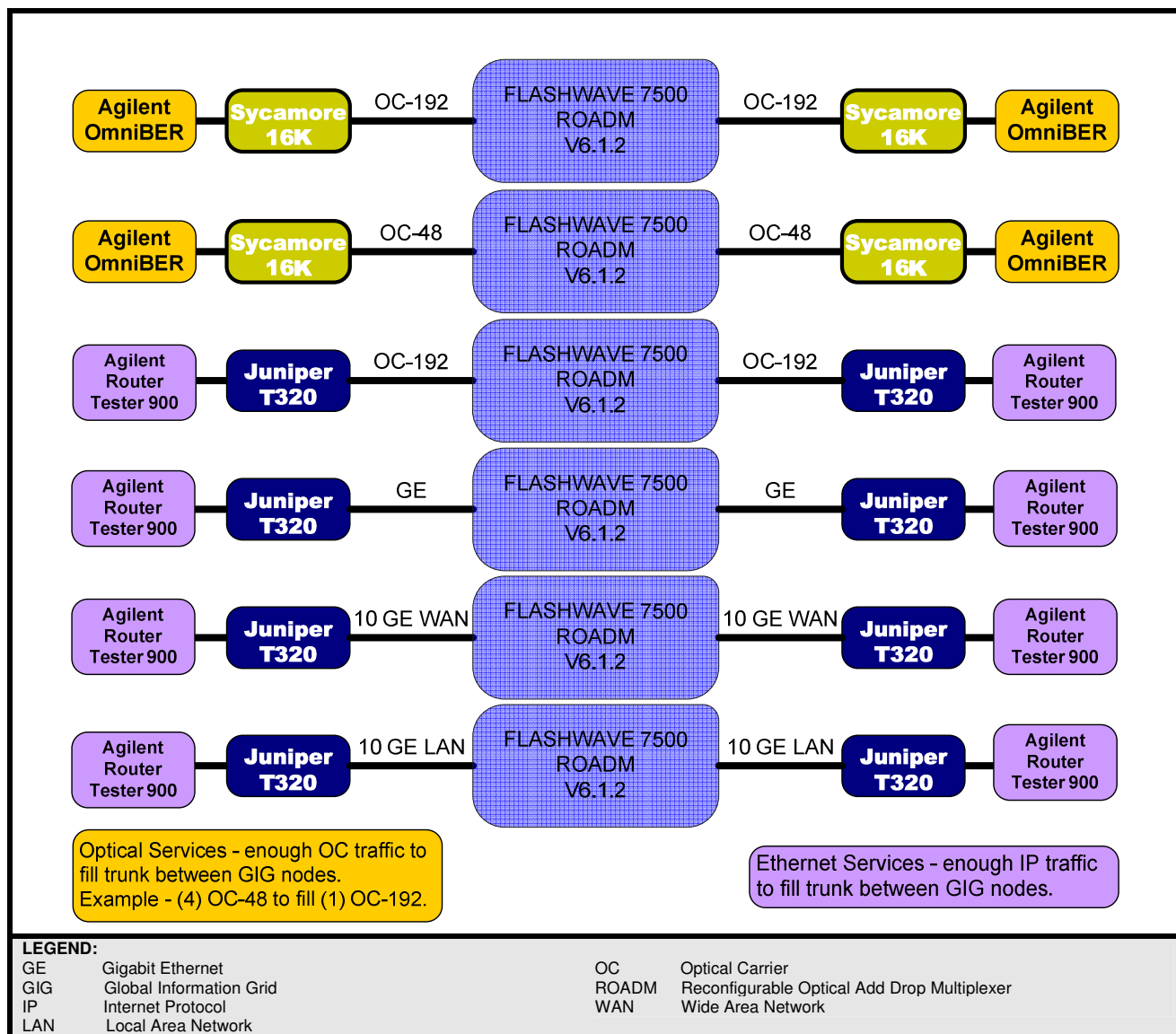


Figure 2-2. Interoperability Test Configuration 1

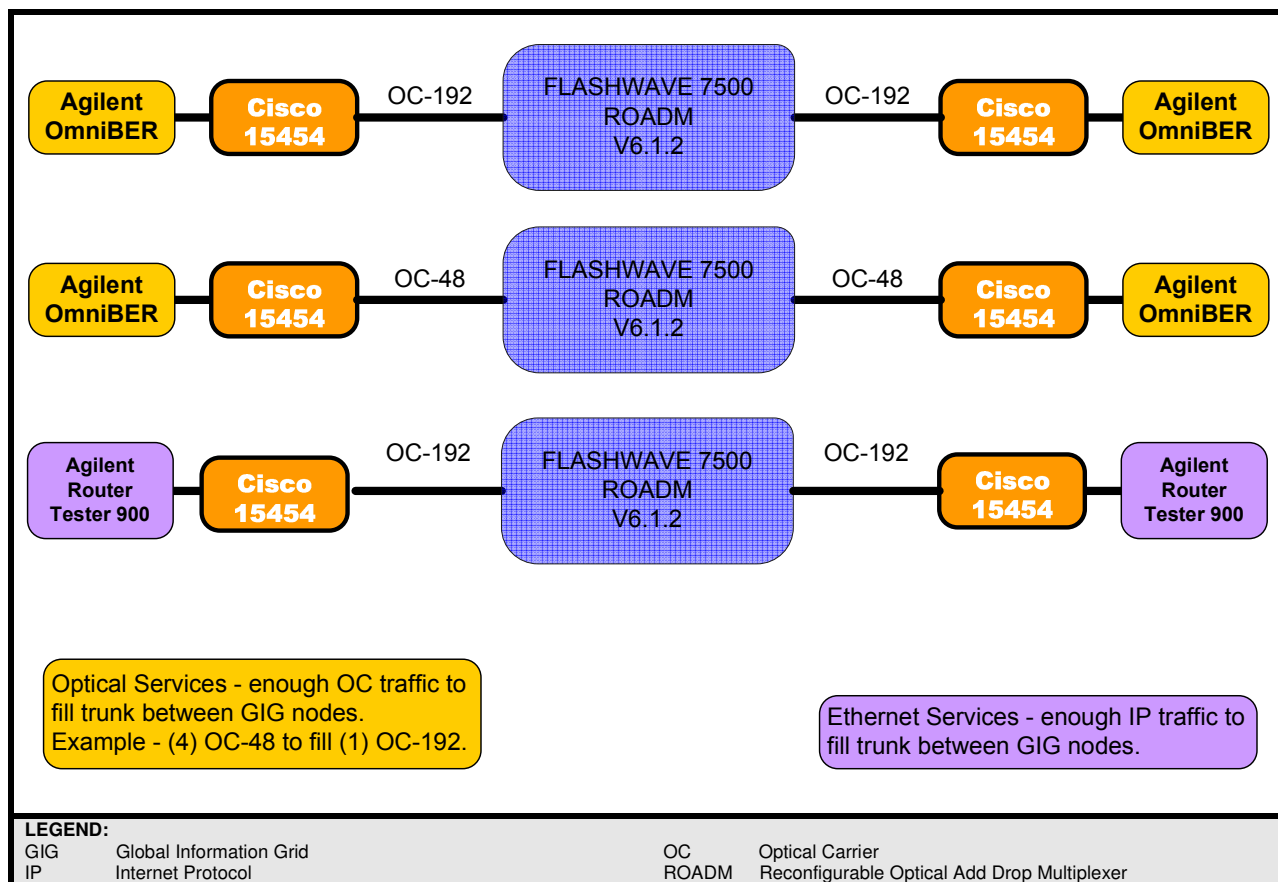


Figure 2-3. Interoperability Test Configuration 2

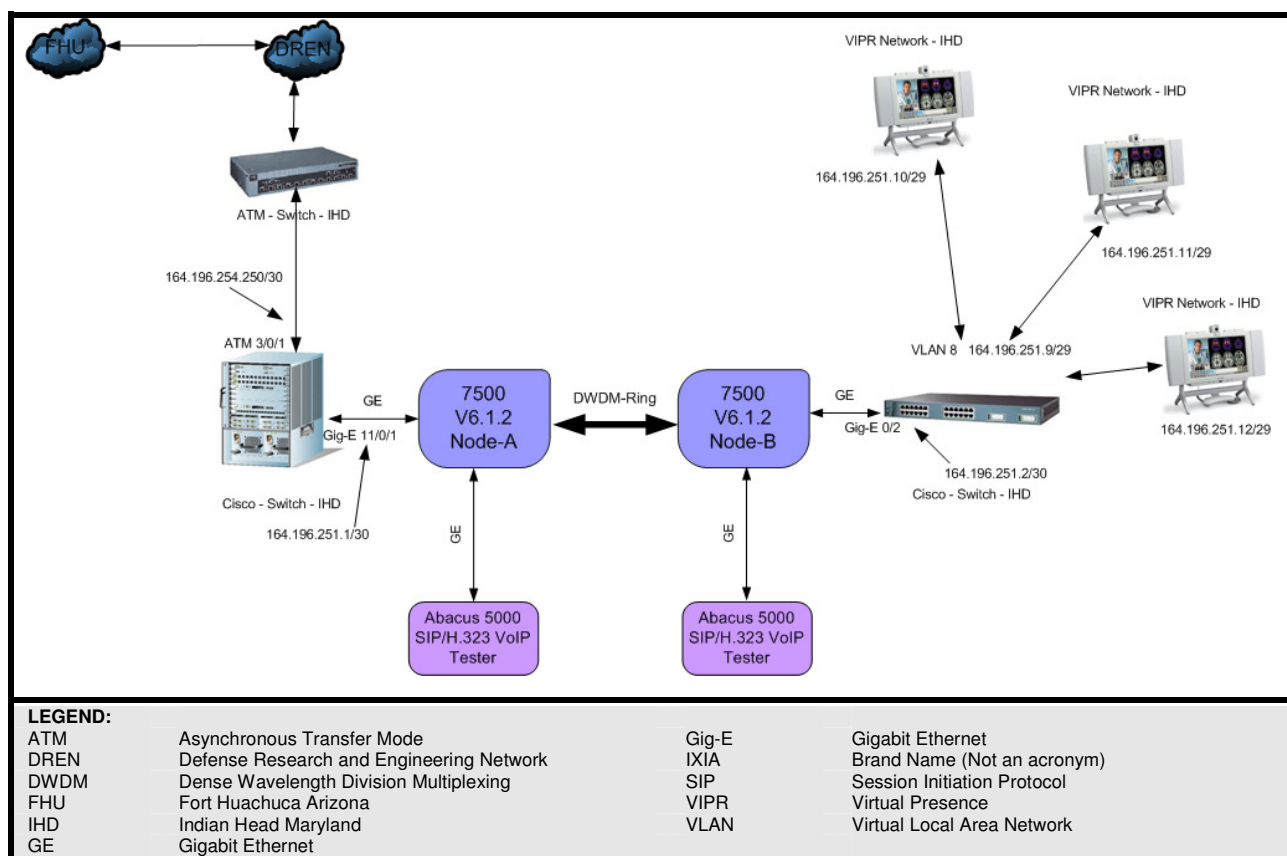


Figure 2-4. Interoperability Test Configuration 3

9. SYSTEM CONFIGURATIONS. Table 2-3 lists the system configurations, Table 2-4 lists the Non-SUT equipments, and Table 2-5 lists the test equipments used in the test. The JITC tested the SUT as DISN-OTS in an operationally realistic environment to determine interoperability with other DISN Architecture components listed in Table 2-6.

Table 2-3. Tested System Configuration

SYSTEM NAME		SOFTWARE RELEASE	
FLASHWAVE 7500 Two-Degree Reconfigurable Optical Add-Drop Multiplexer (ROADM) 40-Channel.		Release 6.1.2.	
FLASHWAVE 7500 Two-Degree Wavelength Selective Switch ROADM 40-Channel.		Release 6.1.2.	
FLASHWAVE 7500 Fixed Optical Add-Drop Multiplexer and ROADM 40-Channel.		Release 6.1.2.	
Multi-degree Hub node scalable in-service to a 12-degree hub configuration 40-Channel.		Release 6.1.2.	
NetSmart 500 EMS. *Only used for configuration purposes and is not certified under the SUT.		Release 3.12.0.	
NetSmart 1500 NMS. *Only used for configuration purposes and is not certified under the SUT.		Release 6.0.0	
CARD NAME	PART NUMBER	NUMBER OF ITEMS	
OC-3 Intermediate Reach	FC95700021	2	
OC-12, Intermediate Reach SFP	FC95700051	2	
OC-48 Short Reach	FC95700080	2	
OC192 Short Reach 1/10 Gigabit Base-Long Reach /10 Gigabit Base	FC9573D410	4	
STM-1 Enhanced	FC95700200	2	
OC-48 SFP - 1530.33nm, 195.9THz, ITU Channel 59	FC95704AAC	2	
OC-48 SFP - 1560.61nm, 192.1THz, ITU Channel 21	FC95704ABS	2	
OC-3 1310nm Intermediate Reach SFP	FC95700051	4	
OC-12 Short Reach / Intermediate Reach SFP	FC95700080	4	
OC-48 Short Reach-1 SFP Transceiver	FC9580C9B1	10	
OC-192, 1310nm Short Reach	FC9580FP11	2	
OC-48 Muxponder	FC9682BXC1	2	
OC-192, 1310nm Short Reach	FC9580FP11	2	
Enhanced 10 Gigabit Flexponder	FC9682GUC1	4	
Gigabit Ethernet Muxponder	FC9682SB13	2	
OLC-B (Short Reach) 1541.35 - 1543.73	FC9682LLC1	1	
10 Gigabit Line Card 40 channel Long Reach	FC9682HGC1	1	
10 Gigabit Line Card 40 channel Short Reach -1	FC9682U1C1*	2	
Universal 10 Gigabit	FC9503LAM1	2	
GBE 1000 BaseSX SFP Transceiver	FC95705010	8	
1000 Base- Long Reach SFP	FC9682SHU2	2	
10 Gigabit Regenerator Unit	FC9682QUC1	2	
40 Gigabit Transponder	FC9682QRC1	1	
40 Gigabit Unidirectional Regenerator	FC9682SHP4	2	
Enhanced 40 Gigabit Muxponder	FC9682QMC1	1	
OC192 Short Reach 1/10 Gigabit Base -Long Reach /10 Gigabit Base XFP	FC9573D410	4	
OC192 Intermediate Reach /10 Gigabit Base-Extended Reach/10 Gigabit Base XFP	FC9573D420	4	
*NETSMART 1500, v5.0 server	PWR-QNUM-75132-1	1	
LEGEND:			
CWDM	Coarse Wavelength Division Multiplexing	SUT	System Under Test
EMS	Element Management System	SFP	Small Form Factor Pluggable
NMS	Network Management System	XFP	10 Gigabit Small Form Factor Pluggable
nm	Nanometer		
OC	Optical Carrier		
*1 The UCR does not stipulate a minimum network-management system requirement for an Optical Transport System.			

Table 2-4. Non-SUT Equipment

DISN EQUIPMENTS	SOFTWARE VERSION	INTERFACE CARDS
Cisco 15454	09.00-008I-17.17	ETH 100T-12-G, OC-3IR-STM1 SH-1310-8, OC-12IR-STM4-1310-4, DS-1N-14, G1K-4, OC-192SR/STM-64, OC-48 AS-IR-1310, DS-3N-12E
Sycamore ODXC	7.6.21 Build 0562.26.27.57.14	GPIC2 2 X OC-192/STM-64, GPIC 24 x OC-3-12/STM1-4IR, GPIC2 8 x OC-48/STM16, USC - OC-192 LR 2c LIM 1
Juniper T320 Router	9.2.R2.15	4 x FE 100 Base Tx, 10 x GigE LAN 1000 Base, 1x OC-192 SM SR2, 1 x 10GigE LAN, XENPAK
LEGEND: DS Digital Signal ETH Ethernet GigE Gigabit Ethernet LAN Local Area Network LIM Line Interface Module OC Optical Carrier ODXC Optical Digital Cross Connect R Revision SM Single Mode SR Short Reach Tx Transmit USC Universal Services Card		

Table 2-5. Test Equipment

Manufacturer	Type	Port Type	Software Version
Agilent	Optical Tester	1550 nm	A.06.01
		1310 nm	
	Router Tester 900	OC-3/OC-12 /POS	6.11
		OC-48 Multilayer	
1000 Base X			
Ixia	Traffic generator	10 Gig	5
		LM1000STX	
Digital Lightwave	Optical Wavelength Manager	Monitor Ports	2.4.0
Spirent Abacus	Bulk Call Generator	T1-RJ45/RJ11	6.0.r20
Agilent	Rack Mounted Router Tester 900	10 Gig LAN/WAN	6.11
		10/100/1000 Base-T	
		1000 Base-X	
		OC-48c POS	
		OC-3/12/POS	
Agilent JDSU	T-Berd 8000	OC-192 POS	6.11
		DSU	6.4
		10/100/1000	
		OC-3-12	
		DS-3	
		OC-192	
LEGEND:			
DS	Digital Signal	nm	Nanometer
DSU	Data Services Unit	OC	Optical Carrier
Gig	Gigabit	POS	Packet Over Synchronous Optical Network
LAN	Local Area Network	WAN	Wide Area Network

10. TEST LIMITATIONS.

- STM-16 interface is not supported by the system and has not been tested.

11. TEST RESULTS

a. Discussion

(1) SUT Certified Interfaces for DISN Architecture. The SUT supports SONET/SDH standard optical carrier interfaces of OC-48, OC-192/STM-64, OC-768/STM-256, and Gigabit Ethernet (GigE) standard interfaces of GigE, 10 GigE Local Area Network, 10 GigE Wide Area Network and Optical Transport Network standard interfaces of Optical Channel Transport Unit (OTU)1/ Optical Channel Data Unit (ODU)1, OTU2/ODU2, OTU3/ODU3 for to transport all of the DISN services, and all of these interfaces were verified in accordance with the applicable UCR 2008 requirements, DISN-OTS-IOP-requirements, and review of vendor LOC documentation. The Table 2-6 represents the respective interface those were tested and certified for the DISN architectures, Table 2-7 represents the UCR Test Results summary and Table 2-8 represents the OTS DISN-IOP Test Results summary.

Table 2-6. SUT Certified Interfaces for DISN Architecture

SUT Certified Interface	DISN Architecture
STM-64	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
STM-256	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
OTU1/ODU1	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
OTU2/ODU2	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
OTU3/ODU3	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
OC-48	DISN-MSPP and DISN-ODXC
OC-192	DISN-MSPP, DISN-ODXC, and DISN-IP-Router
OC-768	For UCR Compliance Only, No Current DISN-OTS-IOP Requirements.
Gigabit Ethernet	DISN-IP-Router, and Transparent Transport of VoIP H.323/SIP Signaling and Data Traffic
10 Gigabit Ethernet-WAN	DISN-IP-Router
10 Gigabit Ethernet-LAN	DISN-IP-Router
LEGEND:	
DISN	Defense Information Systems Network
IOP	Interoperability
IP	Internet Protocol
LAN	Local Area Network
MSPP	Multi-Services Provisioning Platform
ODXC	Optical Digital Cross Connect
OC	Optical Carrier
ODU	Optical Channel Data Unit
OTS	Optical Transport System
OTU	Optical Channel Transport Unit
SIP	Session Initiation Protocol
STM	Synchronous Transport Module
SUT	System Under Test
UCR	Unified Capabilities Requirements
VoIP	Voice over Internet Protocol
WAN	Wide Area Network

(2) Impact Assessment. Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60-millisecond switch time threshold requirement, and these above three modules will negatively impact the operation during a failure where 60-millisecond switch time requirement is critical. In addition, STM-16 interface is not supported by the system and has not been tested and it may negatively impact on an installation where STM-16 interface is critically required.

(3) Security. The UCR, appendix 9, paragraph A9.6, states that the NE shall conform to the requirements outlined in Department of Defense Instruction 8510.bb, "DoD Information Assurance Certification and Accreditation Process," and the applicable DISN Security Technical Implementation Guides. Security is tested as part

of the Information Assurance testing and is covered under a separate report, reference (d).

b. Summary. The SUT is certified for joint use within the DISN as an OTS Element in accordance with the requirements set forth in reference (c). When connected to the interfaces certified in this letter, the SUT and its associated interfaces were transparent to the other DISN elements interfaces causing no degradation of service or negative impact, and met all the required interface and capability and feature requirements, except as noted in paragraph 10 and this paragraph.

12. TEST AND ANALYSIS REPORT. In accordance with the Program Manager's request, the JITC did not prepare a detailed test report, but Table 2-7, UCR Test Results, and Table 2-8, OTS DISN-IOP Test Results, provide a summery report for the actual testing. JITC distributes interoperability information via the JITC Electronic Report Distribution system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program, which .mil/gov users can access on the NIPRNet at <https://stp.fhu.disa.mil>. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool at <http://jit.fhu.disa.mil> (NIPRNet), or <http://199.208.204.125> (Secure Internet Protocol Router Network).

Table 2-7. 7500 UCR Test Results

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
UCR-01	Title: Internal Bit Error Rate Test. Objective: Determine the functionality of the internal BER features of a system node.	Required Result: Internal BER Test capability toward network properly tests E2E network circuit connectivity and performance. Actual Results: Internal BER Test capability toward network properly tested E2E network circuit connectivity and performance.	UCR 2008, Section 5.5.2.5.3
UCR-02	Title: OC-48 Support (Only available on 7500) Objective: Validate interface configuration, connectivity, and measure the OC-48 BER.	Required Result: BER is 10^{-12} or less. Actual Results: Zero Bit Error.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.1
UCR-03	Title: OC-192 Support Objective: Validate interface configuration, connectivity, and measure the OC-192 BER.	Required Result: BER is 10^{-12} or less. Actual Results: Zero Bit Error.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
UCR-04	Title: STM-64 Support Objective: Validate interface configuration, connectivity, and measure the STM-64 BER.	Required Result: BER is 10^{-12} or less. Actual Results: Zero Bit Error.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.5, 5.5.2.6.2
UCR-05	Title: OC-768 Support (Only available on 7500) Objective: Validate interface configuration, connectivity, and measure the OC-768 BER.	Required Result: BER is 10^{-12} or less. Actual Results: Zero Bit Error.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6
UCR-06	Title: STM-256 Support (Only available on 7500) Objective: Validate interface configuration, connectivity, and measure the STM-256 BER.	Required Result: BER is 10^{-12} or less. Actual Results: Zero Bit Error.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.1, 5.5.2.1.2.1.4, 5.5.2.1.2.1.7, 5.5.2.6.6

Table 2-7. 7500 UCR Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
UCR-07	Title: GigE Support Objective: Validate supported interface configuration, connectivity, and measure E2E frame loss.	Required Result: The frame loss is less than 0.1% at a load of 100%. Actual Results: The frame loss was less than 0.1% at a load of 100%.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.3
UCR-08	Title: 10 GigE LAN Support Objective: Validate supported interface configuration, connectivity and measure E2E frame loss.	Required Result: The frame loss is less than 0.1% at a load of 100%. Actual Results: The frame loss was less than 0.1% at a load of 100%.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.5
UCR-09	Title: 10 GigE WAN Support Objective: Validate supported interface configuration, connectivity and measure E2E frame loss.	Required Result: The frame loss is less than 0.1% at a load of 100%. Actual Results: The frame loss was less than 0.1% at a load of 100%.	UCR 2008, Section 5.5.2.1.1.7, 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.1.2.1.4, 5.5.2.1.2.1.6, 5.5.2.6.4
UCR-10	Title: GigE Frame Loss Objective: OTS shall support the transport of the GigE with constant load and measure the percentage of frames not forwarded due to lack of resources.	Required Result: Validates card configuration, connectivity, and throughput. Actual Results: Properly validated card configuration, connectivity, and throughput.	UCR 2008, Section 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.6.3
UCR-11	Title: 10 GigE WAN PHY Frame Loss Objective: OTS shall support the transport of the 10 GigE WAN with constant load and measure the percentage of frames not forwarded due to lack of resources.	Required Result: Validates card configuration, connectivity, and throughput. Actual Results: Properly validated card configuration, connectivity, and throughput.	UCR 2008, Section 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.6.4
UCR-12	Title: 10 GigE LAN Frame Loss Objective: OTS shall support the transport of the 10 GigE LAN with constant load and measure the percentage of frames not forwarded due to lack of resources.	Required Result: Validates card configuration, connectivity, and throughput. Actual Results: Properly validated card configuration, connectivity, and throughput.	UCR 2008, Section 5.5.2.1.1.14, 5.5.2.1.2.1.2, 5.5.2.6.5
UCR-13	Title: Power Source Failures Objective: Verify that a redundant or non-service affecting module or power source for the system allow for error-free operation upon a simulated failure of the primary module/source.	Required Result: If one of the power units fails, an alarm shall be generated and the load shall be carried by the other unit without manual intervention and without interruption of service or functionality. The other power unit shall support the operation of the element/shelf/circuit pack until the problem with the faulty unit is corrected. Actual Results: When one of the power units failed, an alarm was generated and the load was carried by the other unit without manual intervention and without interruption of service or functionality. The other power unit had supported the operation of the element/shelf/circuit pack until the problem with the faulty unit was corrected.	UCR 2008, Section 5.5.2.8.12

Table 2-7. 7500 UCR Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
UCR-14	Title: Software Upgrade Capability Objective: OTS shall have software upgrade capability in a modular fashion, and software rollback capability to previous version, software upgrade shall also use or provide translation of previous version's configuration database, and user has an accessible file system.	Required Result: There should be no bit errors occur during software upgrade. Actual Results: There were no bit errors occur during software upgrade.	UCR 2008, Section 5.5.2.8.40, 5.5.2.8.43, 5.5.2.8.44, 5.5.2.8.45
UCR-15	Title: Node Configuration Objective: Backup and Restore. Verify the equipment configuration can be saved to an external location and restored from an external location.	Required Result: All data services must be restore to their original state at the completion of system back up and restore operation. Actual Results: All data services were restored to their original state at the completion of system back up and restore operation.	UCR 2008, Section 5.5.2.8.39
UCR-16	Title: OSC Objective: OTS shall include an OSC linking the two OTS GNE, with access at each OTS OLA site. All telemetry, data, and voice traffic originating at OTS OLA sites shall be routed over this service channel.	Required Result: It is possible to remotely configure and control equipment via OSC. Communication is not lost when the connection to the primary GNE is removed. Actual Results: It was possible to remotely configure and control equipment via OSC. Communication is not lost when the connection to the primary GNE is removed.	UCR 2008, Section 5.5.2.1.1.6, 5.5.2.10
UCR-17	Title: Wavelength Tunability Objective: Verify that tributary cards can be tuned to all of the wavelength channels available on the system.	Required Result: The tributary card is tunable to all of the wavelengths channels available on the system. Actual Results: The tributary card was tunable to all of the wavelengths channels available on the system.	UCR 2008, Section 5.5.2.5.1, 5.5.2.5.2
UCR-18	Title: Addition of Wavelengths Objective: Determine the capability of the system to add wavelengths without affecting other services transported by the system.	Required Result: Zero bit errors occur when wavelengths are added. Actual Results: Zero bit errors occurred when wavelengths are added.	UCR 2008, Section 5.5.2.1.1.3, 5.5.2.11.12, 5.5.2.11.13, 5.5.2.11.19.
UCR-19	Title: Deletion of Wavelengths Objective: Determine the capability of the system to delete wavelengths without affecting other services transported by the system	Required Result: Zero bit errors occur when wavelengths are dropped. Actual Results: Zero bit errors occurred when wavelengths are dropped.	UCR 2008, Section 5.5.2.1.1.3, 5.5.2.11.12, 5.5.2.11.13, 5.5.2.11.19

Table 2-7. 7500 UCR Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
UCR-20	Title: House Keeping Alarms Objective: Verify that system's primary OS interface shall provide the capability for reporting alarms of external equipment and general housekeeping alarms. A minimum of 16 user-defined alarms shall be provided, with the option to expand to 32 user-defined alarm points. Capability shall be provided for minimum of 8 user-defined remote control points for external functions. This capability shall be provide by relays, not TTL.	Required Result: System's primary OS interface shall provide the capability for reporting alarms of external equipment and general housekeeping alarms. A minimum of 16 user-defined alarms shall be provided, with the option to expand to 32 user-defined alarm points. Capability shall be provided for minimum of eight user defined remote control points for external functions. This capability shall be provide by relays, not TTL. Actual Results: System's primary OS interface had provided the capability for reporting alarms of external equipment and general housekeeping alarms. 16 user-defined alarms were provided. Capability was provided for four user defined remote control points for external functions. This capability was provided via relays, not via TTL.	UCR 2008, Section 5.5.2.8.38
UCR-21	Title: Automatic Laser Shutdown or Automatic Laser Power Down to a Safe Power Level Objective: Verify that an automatic laser shutdown or automatic laser power down to a safe power level occurs in the event of a fiber cut.	Required Result: Automatic laser shutdown or automatic laser power down to a safe power level occurs when fiber connectivity is interrupted. Actual Results: Automatic laser shutdown or automatic laser power down to a safe power level occurred when fiber connectivity was interrupted.	UCR 2008, Section 5.5.2.9.20
UCR-22	Title: EMS/NMS Optical Protection Switch Times-SONET Objective: Verify that O-UPSR protection can be managed by a user within acceptable switch times for SONET traffic.	Required Result: Switch time is less than or equal to 60 milliseconds (10 milliseconds for signaling plus 50 milliseconds for switching). Actual Results: Switch time of U1C1 Module configured as an OC-192 was less than 60 milliseconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-23	Title: EMS/NMS Optical Protection Switch Times-SDH Objective: Verify that O-UPSR protection can be managed by a user within acceptable switch times for SDH traffic.	Required Result: Switch time is less than or equal to 60 milliseconds (10 milliseconds for signaling plus 50 milliseconds for switching). Actual Results: Switch time of U1C1 Module configured as STM-64 was less than 60 milliseconds.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-24	Title: OC-192 Optical Protection Automatic Switch Times Objective: Verify OC-192 service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 milliseconds (10 milliseconds for signaling plus 50 milliseconds for switching). Actual Results: Switch time of U1C1 Module configured as an OC-192 was less than 60 milliseconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-25	Title: OC-48 Optical Protection Automatic Switch Times (Only available on 7500) Objective: Verify OC-48 service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 milliseconds (10 milliseconds for signaling plus 50 milliseconds for switching). Actual Results: Switch time was less than 60 milliseconds.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29

Table 2-7. 7500 UCR Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
UCR-26	Title: STM-64 Optical Protection Automatic Switch Times Objective: Verify STM-64 service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 milliseconds (10 milliseconds for signaling plus 50 milliseconds for switching). Actual Results: Switch time of U1C1 Module configured as STM-64 was less than 60 milliseconds.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-27	Title: GigE Optical Protection Automatic Switch Times Objective: Verify GigE service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 seconds. Actual Results: Switch time was less than 60 seconds.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-28	Title: 10 GigE LAN Optical Protection Automatic Switch Times Objective: Verify 10 GigE LAN service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 seconds. Actual Results: Switch time of U1C1 Module configured as 10 GigE LAN was less than 60 seconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-29	Title: 10 GigE WAN Optical Protection Automatic Switch Times Objective: Verify 10 GigE WAN service is automatically protected by the O-UPSR within acceptable switch times.	Required Result: Switch time is less than or equal to 60 seconds. Actual Results: Switch time of U1C1 Module configured as an OC-192 for transporting 10 GigE WAN was less than 60 seconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	UCR 2008, Section 5.5.2.11.23, 5.5.2.11.24, 5.5.2.11.25, 5.5.2.11.26, 5.5.2.11.27, 5.5.2.11.28, 5.5.2.11.29
UCR-30	Title: SIP VoIP One-way Latency Objective: Verify that one-way latency of an E2E SIP simulated system supporting VoIP is 150 ms or less between two nodes as averaged over any 5-minute threshold period.	Required Result: The one-way latency of an E2E SIP simulated system supporting VoIP is 150 ms or less between two nodes as averaged over any 5-minute threshold period. Actual Results: The one-way latency of an E2E SIP simulated system supporting VoIP was less than 8 ms between two nodes as averaged over any 5-minute threshold period.	UCR 2008, Section 5.3.3.4.1
UCR-31	Title: SIP VoIP Packet Loss Objective: Verify that packet loss of an E2E SIP simulated system supporting VoIP is 1.0 percent or less between two nodes as averaged over any 5-minute period.	Required Result: The packet loss of an E2E SIP simulated system supporting VoIP is 1.0 percent or less between two nodes as averaged over any 5-minute period. Actual Results: The packet loss of an E2E SIP simulated system supporting VoIP was 0 percent between two nodes as averaged over any 5-minute period.	UCR 2008, Section 5.3.3.6.1
UCR-32	Title: SIP VoIP Jitter Objective: Verify that jitter of an E2E SIP simulated system supporting VoIP is 15 ms or less between two nodes during any 5-minute period.	Required Result: The jitter of an E2E SIP simulated system supporting VoIP is 15 ms or less between two nodes during any 5-minute period. Actual Results: The jitter of an E2E SIP simulated system supporting VoIP was less than 7 ms between two nodes during any 5-minute period.	UCR 2008, Section 5.3.3.5.1

Table 2-7. 7500 UCR Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES																																																
UCR-33	Title: H.323 VoIP One-way Latency Objective: Verify that one-way latency of an E2E H.323 simulated system supporting VoIP is 150 ms or less between two nodes as averaged over any 5-minute threshold period.	Required Result: The one-way latency of an E2E H.323 simulated system supporting VoIP is 150 ms or less between two nodes as averaged over any 5-minute threshold period. Actual Results: The one-way latency of an E2E H.323 simulated system supporting VoIP was less than 6 ms between two nodes as averaged over any 5-minute threshold period.	UCR 2008, Section 5.3.3.4.1																																																
UCR-34	Title: H.323 VoIP Packet Loss Objective: Verify that packet loss of an E2E H.323 simulated system supporting VoIP is 1.0 percent or less between two nodes as averaged over any 5-minute period.	Required Result: The packet loss of an E2E H.323 simulated system supporting VoIP is 1.0 percent or less between two nodes as averaged over any 5-minute period. Actual Results: The packet loss of an E2E H.323 simulated system supporting VoIP was 0 percent between two nodes as averaged over any 5-minute period.	UCR 2008, Section 5.3.3.6.1																																																
UCR-35	Title: H.323 VoIP Jitter Objective: Verify that jitter of an E2E H.323 simulated system supporting VoIP is 15 ms or less between two nodes during any 5-minute period.	Required Result: The jitter of an E2E H.323 simulated system supporting VoIP is 15 ms or less between two nodes during any 5-minute period. Actual Results: The jitter of an E2E H.323 simulated system supporting VoIP was less than 6 ms between two nodes during any 5-minute period.	UCR 2008, Section 5.3.3.5.1																																																
LEGEND: <table border="0"> <tr> <td>BER</td><td>Bit Error Ratio</td> <td>O-UPSR</td><td>Optical-Unidirectional Path Switched Ring</td> </tr> <tr> <td>E2E</td><td>End-to-End</td> <td>OTS</td><td>Optical Transport System</td> </tr> <tr> <td>EMS</td><td>Element Management System</td> <td>PHY</td><td>Physical</td> </tr> <tr> <td>GigE</td><td>Gigabit Ethernet</td> <td>SDH</td><td>Synchronous Digital Hierarchy</td> </tr> <tr> <td>GNE</td><td>Gateway Network Element</td> <td>SIP</td><td>Session Initiation Protocol</td> </tr> <tr> <td>LAN</td><td>Local Area Network</td> <td>SONET</td><td>Synchronous Optical Network</td> </tr> <tr> <td>ms</td><td>millisecond</td> <td>STM</td><td>Synchronous Transport Module</td> </tr> <tr> <td>NMS</td><td>Network Management System</td> <td>TTL</td><td>Time to Live</td> </tr> <tr> <td>OC</td><td>Optical Carrier</td> <td>UCR</td><td>Unified Capabilities Requirements</td> </tr> <tr> <td>OLA</td><td>Optical Line Amplifier</td> <td>VoIP</td><td>Voice over Internet Protocol</td> </tr> <tr> <td>OS</td><td>Operating System</td> <td>WAN</td><td>Wide Area Network</td> </tr> <tr> <td>OSC</td><td>Optical Supervisory Channel</td><td></td><td></td> </tr> </table>				BER	Bit Error Ratio	O-UPSR	Optical-Unidirectional Path Switched Ring	E2E	End-to-End	OTS	Optical Transport System	EMS	Element Management System	PHY	Physical	GigE	Gigabit Ethernet	SDH	Synchronous Digital Hierarchy	GNE	Gateway Network Element	SIP	Session Initiation Protocol	LAN	Local Area Network	SONET	Synchronous Optical Network	ms	millisecond	STM	Synchronous Transport Module	NMS	Network Management System	TTL	Time to Live	OC	Optical Carrier	UCR	Unified Capabilities Requirements	OLA	Optical Line Amplifier	VoIP	Voice over Internet Protocol	OS	Operating System	WAN	Wide Area Network	OSC	Optical Supervisory Channel		
BER	Bit Error Ratio	O-UPSR	Optical-Unidirectional Path Switched Ring																																																
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EMS	Element Management System	PHY	Physical																																																
GigE	Gigabit Ethernet	SDH	Synchronous Digital Hierarchy																																																
GNE	Gateway Network Element	SIP	Session Initiation Protocol																																																
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OS	Operating System	WAN	Wide Area Network																																																
OSC	Optical Supervisory Channel																																																		

Table 2-8. OTS DISN-IOP Test Results

NUMBER	TITLE/ OBJECTIVE	RESULTS	MAIN REFERENCES
7500 IOP-01	Title: Support of OC-48, OC-192, GigE, 10 GigE WAN, and 10 GigE LAN interfaces to Transport DISN Services. Objective: OTS shall support OC-48, OC-192/, GigE, 10 GigE WAN, and 10 GigE LAN interfaces to transport DISN services.	Required Result: OTS support OC-48, OC-192, GigE, 10 GigE WAN, and 10 GigE LAN interfaces to transport DISN services. Actual Results: OTS supported OC-48, OC-192, GigE, 10 GigE WAN, and 10 GigE LAN interfaces to transport DISN services.	DISN-OTS-IOP-01
7500 IOP-02	Title: Transport of DISN-Access GigE Circuit Provisioned via DISN-Access OC-192 Trunk Objective: OTS shall transport DISN-Access GigE circuit provisioned via DISN-Access OC-192 trunk across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-02
7500 IOP-03	Title: Transport of DISN-Access GigE Circuit Provisioned via DISN-ODXC OC-192 Trunk. Objective: OTS shall transport DISN-Access GigE circuit provisioned via DISN-ODXC OC-192 trunk across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-03
7500 IOP-04	Title: Transport of DISN-Provider (P) Router GigE Circuit Objective: OTS shall transport DISN-P Router GigE circuit across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-04
7500 IOP-05	Title: Transport of DISN-Access OC-3 Circuit Provisioned via DISN-Access OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-3 circuit provisioned via DISN-Access OC-192 trunk across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-05
7500 IOP-06	Title: Transport of DISN-Access OC-3 Circuit Provisioned via DISN-ODXC OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-3 Circuit provisioned via DISN-ODXC OC-192 trunk across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-06
7500 IOP-07	Title: Transport of DISN-Access OC-12 Circuit Provisioned via DISN-Access OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-12 circuit provisioned via DISN-Access OC-192 trunk across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-07
7500 IOP-08	Title: Transport of DISN-Access OC-12 Circuit Provisioned via DISN-ODXC OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-12 circuit provisioned via DISN-ODXC OC-192 trunk across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-08
7500 IOP-09	Title: Transport of DISN-Access OC-48 Circuit Provisioned via DISN-Access OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-48 circuit provisioned via DISN-Access OC-192 trunk across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-09

Table 2-8. OTS DISN-IOP Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
7500 IOP-10	Title: Transport of DISN-Access OC-48 Circuit Provisioned via DISN-ODXC OC-192 Trunk Objective: OTS shall transport of DISN-Access OC-48 circuit provisioned via DISN-ODXC OC-192 Trunk across OTS	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-10
7500 IOP-11	Title: Transport of DISN-Access OC-192 Circuit Objective: OTS shall transport of DISN-Access OC-192 circuit across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-11
7500 IOP-12	Title: Transport of DISN-ODXC OC-192 Circuit Objective: OTS shall transport of DISN-ODXC OC-192 circuit across OTS.	Required Result: The E2E BER is less than 10^{-12} . Actual Results: Zero Bit Error.	DISN-OTS-IOP-12
7500 IOP-13	Title: Transport of DISN-P Router OC-192 Circuit Objective: OTS shall transport DISN-P Router OC-192 circuit across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-13
7500 IOP-14	Title: Transport of DISN-P Router OC-192 circuit Provisioned via DISN-ODXC OC-192 Trunk Objective: OTS shall transport DISN-P Router OC-192 circuit provisioned via DISN-ODXC OC-192 trunk across OTS	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-14
7500 IOP-15	Title: Transport of DISN-P Router 10 GigE LAN Circuit Objective: OTS shall transport DISN-P Router GigE LAN circuit across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-15
7500 IOP-16	Title: Transport of DISN-P Router 10 GigE WAN Circuit Objective: OTS shall transport DISN-P Router GigE WAN circuit across OTS.	Required Result: The E2E frame loss is less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes. Actual Results: The E2E frame loss was less than 0.1% at a load of 100% of line rate for all RFC-2544 specified frame sizes.	DISN-OTS-IOP-16
7500 IOP-17	Title: Protection of Transported DISN-P Router GigE Service Objective: OTS shall provide protected path for transported DISN-P Router GigE service.	Required Result: The switch time for GigE circuit is less than or equal to 60 seconds. Actual Results: Switch time was less than 60 seconds.	DISN-OTS-IOP-17
7500 IOP-18	Title: Protection of Transported DISN-P Router 10 GigE LAN Service Objective: OTS shall provide protected path for transported DISN-P Router 10 GigE LAN service.	Required Result: The switch time for 10 GigE LAN circuit is less than or equal to 60 seconds. Actual Results: Switch time of U1C1 Module configured as 10 GigE LAN was less than 60 seconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 seconds switch time threshold requirement.	DISN-OTS-IOP-18

Table 2-8. OTS DISN-IOP Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES
7500 IOP-19	Title: Protection of Transported DISN-Access OC-48 Service. (Available only for the 7500) Objective: OTS shall provide protected path for transported DISN-Access OC-48 Service.	Required Result: The BER is less than 10^{-12} , and switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Zero Bit Error, and Switch time was less than 60 milliseconds.	DISN-OTS-IOP-19
7500 IOP-20	Title: Protection of Transported DISN-ODXC OC-48 Service (Available only for the 7500) Objective: OTS shall provide protected path for transported DISN-ODXC OC-48 Service.	Required Result: The BER is less than 10^{-12} , and switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Zero Bit Error, and Switch time was less than 60 milliseconds.	DISN-OTS-IOP-20
7500 IOP-21	Title: Protection of Transported DISN-Access OC-192 Service Objective: OTS shall provide protected path for transported DISN-Access OC-192 Service.	Required Result: The BER is less than 10^{-12} , and switch time for OC-192 circuit is less than or equal to 60 milliseconds. Actual Results: Zero Bit Error and Switch time of U1C1 and HGC1 Modules configured as an OC-192 was less than 60 milliseconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	DISN-OTS-IOP-21
7500 IOP-22	Title: Protection of Transported DISN-ODXC OC-192 Service Objective: OTS shall provide protected path for transported DISN-ODXC OC-192 Service.	Required Result: The BER is less than 10^{-12} , and switch time for OC-192 circuit is less than or equal to 60 milliseconds. Actual Results: Zero Bit Error and Switch time of U1C1 and HGC1 Modules configured as an OC-192 was less than 60 milliseconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	DISN-OTS-IOP-22
7500 IOP-23	Title: Protection of Transported DISN-P Router OC-192 Service Objective: OTS shall provide protected path for transported DISN-P Router OC-192 Service.	Required Result: The BER is less than 10^{-12} , and switch time for OC-192 circuit is less than or equal to 60 seconds. Actual Results: Zero Bit Error and Switch time of U1C1 and HGC1 Modules configured as an OC-192 was less than 60 milliseconds. In addition, Quad 10 Gigabit Module QMC1, 40 Gigabit Regen Module QRC1, and 10 Gigabit Regen Module RGC1 did not meet the 60 milliseconds switch time threshold requirement.	DISN-OTS-IOP-23
7500 IOP-24	Title: Transport of DISN-Access Protected OC-48 Service (Available only for the 7500) Objective: OTS shall transport of DISN-Access protected OC-48 service across the OTS equipment transparently via two non-protected circuits.	Required Result: The switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Switch time was less than 60 milliseconds.	DISN-OTS-IOP-24
7500 IOP-25	Title: Transport of DISN-ODXC Protected OC-48 Service (Available only for the 7500) Objective: OTS shall transport of DISN-ODXC protected OC-48 Service across the OTS equipment transparently via two non-protected circuits.	Required Result: The switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Switch time was less than 60 milliseconds.	DISN-OTS-IOP-25

Table 2-8. OTS DISN-IOP Test Results (continued)

NUMBER	TITLE/OBJECTIVE	RESULTS	MAIN REFERENCES																																
7500 IOP-26	Title: Transport of DISN-Access Protected OC-192 Service Objective: OTS shall transport of DISN-Access protected OC-48 service across the OTS equipment transparently via two non-protected circuits.	Required Result: The switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Switch time was less than 60 milliseconds.	DISN-OTS-IOP-26																																
7500 IOP-27	Title: Transport of DISN-ODXC Protected OC-192 Service Objective: OTS shall transport of DISN-ODXC protected OC-48 Service across the OTS equipment transparently via two non-protected circuits.	Required Result: The switch time for OC-48 circuit is less than or equal to 60 milliseconds. Actual Results: Switch time was less than 60 milliseconds.	DISN-OTS-IOP-27																																
LEGEND: <table> <tr> <td>BER</td><td>Bit Error Ratio</td><td>OTS</td><td>Optical Transport System</td></tr> <tr> <td>DISN</td><td>Defense Information Systems Network</td><td>P</td><td>Provider</td></tr> <tr> <td>E2E</td><td>End-to-End</td><td>RFC</td><td>Request for Comment</td></tr> <tr> <td>GigE</td><td>Gigabit Ethernet</td><td>SIP</td><td>Session Initiation Protocol</td></tr> <tr> <td>IOP</td><td>Interoperability</td><td>STM</td><td>Synchronous Transport Module</td></tr> <tr> <td>LAN</td><td>Local Area Network</td><td>VoIP</td><td>Voice over Internet Protocol</td></tr> <tr> <td>OC</td><td>Optical Carrier</td><td>WAN</td><td>Wide Area Network</td></tr> <tr> <td>ODXC</td><td>Optical Digital Cross Connect</td><td></td><td></td></tr> </table>				BER	Bit Error Ratio	OTS	Optical Transport System	DISN	Defense Information Systems Network	P	Provider	E2E	End-to-End	RFC	Request for Comment	GigE	Gigabit Ethernet	SIP	Session Initiation Protocol	IOP	Interoperability	STM	Synchronous Transport Module	LAN	Local Area Network	VoIP	Voice over Internet Protocol	OC	Optical Carrier	WAN	Wide Area Network	ODXC	Optical Digital Cross Connect		
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